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ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES

THE TEXTILES, FRICTION AND SEALING MATERIALS SEGMENT OF THE ASBESTOS MANUFACTURING INDUSTRY

ARTHUR D. LITTLE, INCORPORATED

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY

JULY 1975

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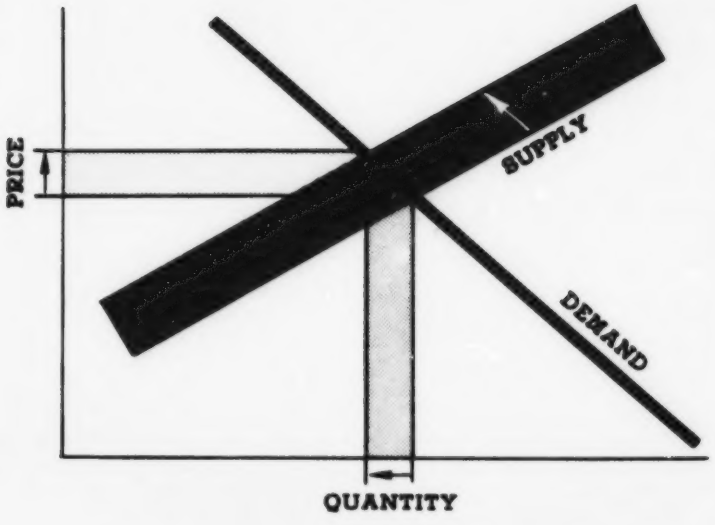

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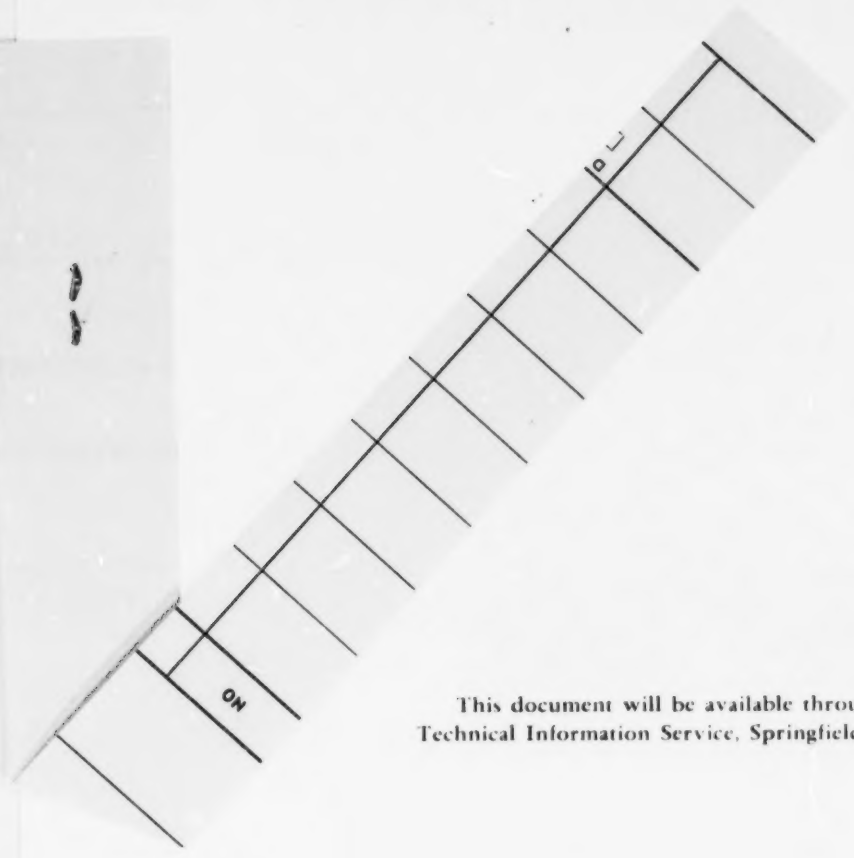

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No industry wide price increases are expected to occur as a consequence of BPT standards and a 1% price increase is expected for friction materials as a result of BAT standards. No production curtailment or plant closure are anticipated as a result of the proposed standards.

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OF
EFFLUENT GUIDELINES:
THE TEXTILE, FRICTION AND SEALING MATERIALS SEGMENTS
OF THE ASBESTOS PRODUCT MANUFACTURING INDUSTRY

Report to

U.S. ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER, 1975

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PREFACE

The attached document is a contractor's study prepared with the supervision and review of the Office of Planning and Evaluation of the U.S. Environmental Protection Agency (EPA). Its purpose is to provide a basis for evaluating the potential economic impact of effluent limitations guidelines and standards of performance established by EPA pursuant to sections 304(b) and 306 of the Federal Water Pollution Control Act.

The study supplements an EPA technical "Development Document" issued in conjunction with the promulgation of guidelines and standards for point sources within this industry category. The Development Document surveys existing and potential waste treatment and control methods and technologies within this category and presents the investment and operating costs associated with various control technologies. This study supplements that analysis by estimating the broader economic effects (including product price increases, continued viability of affected plants, employment, industry growth and foreign trade) of the required application of certain of these control technologies.

This study has been submitted in fulfillment of Control No. 68-01-1541 Task No. 18 by Arthur D. Little, Inc. Work was completed as of July, 1975. The study is based primarily upon an earlier study, also prepared by Arthur D. Little, Inc. entitled "Economic Analysis of Proposed Effluent Guidelines for the Asbestos Product Manufacturing Industry." The earlier report was circulated in conjunction with the publication of the Federal Register of a notice of proposed rulemaking under sections 304(b) and 306 for the subject point source category. The analysis contained in the original study has been updated based upon information received during the period of time between publication of the notice of proposed rulemaking and the promulgation of the final regulation. Because of the constraints of time, the control and treatment costs analyzed in this study may not in all instances be identical to those associated with the requirements of the promulgated regulation. However, those differences, when they exist, are minor insofar as the final conclusions of the study are concerned.

This report represents the conclusions of the contractor. It has been reviewed by the Office of Planning and Evaluation and approved for publication. Approval does not signify that the contents necessarily reflect the views of the Environmental Protection Agency. The study has been considered, together with the Development Document, information received in the form of public comments on the proposed regulation, and other materials in the establishment of final effluent limitations guidelines and standards of performance.

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EXECUTIVE SUMMARY

The potential economic impact on the textiles, friction and sealing materials segment of the asbestos product manufacturing industry were assessed on the basis of effluent treatment technologies and the corresponding incremental costs presented in the relevant Development Document for Effluent Limitations Guidelines. A survey conducted by an EPA-sponsored contractor pursuant to the preparation of the above document identified only nine manufacturing facilities in the above segments of the industries that generated any disposable effluents. Two of these plants are producers of asbestos textiles, one is involved in sheet gaskets manufacture, and six plants manufacture friction products. Both textile plants discharge their effluents into municipal sewer systems, and two of the friction products plants have no discharge into surface waters. All four plants are excluded from consideration in this study since they are not covered by the provisions of the proposed standards.

With respect to the "Best Practicable Technology" (BPT) standards, only one sheet gaskets manufacturing plant is expected to incur additional costs to comply with the guidelines. Its incremental capital expenditures (1973 dollars) are projected to be $80,300, and its "annualized" water treatment costs amount to $35,500. To meet the "Best Available Technology" (BAT) standards, the above sheet gaskets and four friction materials manufacturing plants are expected to incur total additional capital costs of $632,500 and "annualized" water treatment costs of $139,200.

In assessing the potential economic impact of the standards, the primary determinant of impact severity was taken to be the ratio of the incremental "annualized" costs incurred by an effluent-discharging plant as a percentage of its estimated annual sales of the base products. A plant was adjudged to be threatened with closure if the incremental annual effluent treatment costs approached the pre-tax profit margins derived for the various subcategories, i.e.:

Asbestos textiles	5.8 percent
Friction materials	6.0 percent
Gaskets/packings/sealing devices . .	11.0 percent

On the basis of this criterion, none of the effluent-discharging plants was judged to be in danger of production curtailment or plant closure as a direct consequence of the proposed standards.

While it is recognized that there are competitive materials on the horizon which could substitute for the subject asbestos products in certain specialized applications, and while it is further recognized that, with respect to friction materials, the existence of large captive manufacturers (the automotive companies) may tend to dampen price

increases by the non-captive producers, it is nevertheless concluded that these price-moderating factors will not deter the passing-on of additional costs incurred by the industry segment due to the proposed standards. Accordingly, a price increase on the order of 1 percent is deemed likely in the friction materials sub-category as a result of the BAT standards. No industry-wide price increases are expected to occur as a consequence of the BPT standards.

Furthermore, no adverse impacts are expected on the production and market growth of the various sub-categories. Similarly, the historical balance of trades, with respect to the subject products, in favor of the United States is expected to continue, unaffected by the proposed effluent standards.

The "New Source Performance" (NSP) standards involve very minimal additional capital expenditures to a proposed new plant. Accordingly, these expenditures should not deter investments in new facilities, and neither are they considered a significant adverse factor in any decision regarding the preferential location (domestic versus foreign) of a new plant.

PART I: INDUSTRY STRUCTURE

I-A: ASBESTOS TEXTILES

I-B: ASBESTOS FRICTION MATERIALS

I-C: ASBESTOS GASKETS, PACKING AND INSULATION MATERIALS

A: ASBESTOS TEXTILES

Asbestos textiles include asbestos-bearing yarn, cord, thread, cloth, roving, lap, wick, rope, tape, carded fibers, etc. It is estimated that about 3 percent of the 1972 U.S. consumption of asbestos fibers--a total of 792,000 short tons--went to textiles manufacturing. Preliminary 1973 statistics indicate a total fiber consumption (for all purposes) of 8 to 10 percent above the 1972 level. Assuming a yearly escalation in value of textiles shipments equivalent to about 8 percent (per year) above the 1971 level of $38.2 million, (which accounts for both price inflation and the normal growth in business level), 1973 shipments could then be projected at about $44.5 million. By comparison, 1967 and 1963 shipment values were $30.9 million and $26 million, respectively. It is probable that the above estimates exclude the value of interplant transfers of textiles within the same corporate organization, where the transferred material undergoes additional processing for transformation into other finished products such as friction materials.

1: MANUFACTURING PROCESS AND TECHNOLOGY

Textiles manufacture generally begins with milled fibers which are delivered to vibrating screens where the fibers are removed and graded by an air aspiration system. Either in a preliminary mixing process or during carding, the separated fibers are blended with organic fibers such as cotton rayon, which act as carriers and supporting agents for the shorter asbestos fibers, thus improving their spinning characteristics. The usual organic fiber content is between 20 and 25 percent. The blended fibers undergo an additional opening/cleaning process by the carding machine which combs the fibers into a parallel arrangement to form a coherent mat of material. Strips are separated from the mat and mechanically compressed between oscillating surfaces into untwisted strands which are then wound onto spindles to form the roving from which asbestos textile yarn is made.

Through the twisting and pulling operations performed by a spinning machine, the relatively weak roving is transformed into a stronger yarn. Asbestos twine or cord is produced by twisting together two or more yarns on a spinning frame. Braided textile products are manufactured on various types of packing and braiding machines. Asbestos yarns are woven into fabric on looms that operate similarly to those that produce conventional cloth goods.

2: FIRMS

Listed in Table A-1 are the major U.S. asbestos textile manufacturing firms, their plant locations, and the estimated number of production employees involved in textiles manufacture at the respective plants.

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The firms listed probably account for 95 percent of the nation's shipments of asbestos textiles. Furthermore, the so-called "Big Three" of the industry--Raybestos-Manhattan, Inc., Southern Asbestos Company (subsidiary of H. K. Porter, Inc.), and Amatex Corporation--are probably responsible for 75 to 80 percent.

Virtually all the firms listed in Table A-1 manufacture other products in addition to textiles. For instance, Raybestos-Manhattan is involved in seven business lines--friction materials, engineered textiles, rivets and rivet-setting machinery, rubber-covered rolls, packing and sealing products, reinforced plastics, and bowling balls. For this firm, asbestos textiles manufacture is usually an intermediate step in its production of some lines of friction and engineered textile products. In general, it can be stated that for most of the firms involved in asbestos textile manufacture, this product contributes less than 25 percent of the annual business; furthermore, there are indications that this ratio is declining as the trend towards diversification into other more profitable non-asbestos products and manufacturing intensifies.

While most of the textile-producing firms utilize raw fiber not produced at their own mines, three of the listed major firms are integrated backwards to varying degrees into fiber mining and milling, and as such, consume some captively-produced fibers. Raybestos-Manhattan owns a partial interest (550,000 shares) in Cassiar Asbestos Corporation Ltd., a Canadian supplier of long-length asbestos fiber, with annual fiber production capacity of about 110,000 tons. H. K. Porter, the parent firm of Southern Asbestos Company, owns about 75 percent of the common stock of Pacific Asbestos Corporation, Copperopolis, California, with a rated fiber-producing capacity of about 50,000 tons per year. Johns-Manville is the world's largest producer of asbestos fiber, with mines in Canada and California. Canadian Johns-Manville Company Ltd., has a fiber-production capacity of about 850,000 tons, and Coalinga Asbestos Corporation, in which Johns-Manville owns 80 percent interest, is rated at about 15,000 tons of fiber per year.

3: PLANTS

It can be observed from Table A-1 that, in general, an asbestos textile plant is small in comparison with other manufacturing facilities. Of the 15 plants listed, only five are thought to employ 300 or more production workers. The remaining plants average only about 135 per plant. Inclusive of other salaried and supervisory/management personnel, an average plant would employ between 200 and 250, with annual sales on the order of $6.5 million.

Geographically, all the major plants are located in the Northeastern, Mid-Atlantic, and Southeastern states, (Figure A-1), with significant clusters around the Philadelphia and Charlotte, N.C. areas. It can be surmised that their market perimeters are similarly limited to these regions, and shipments to the Western states are probably few and far between. The West is primarily a consumer of finished rather than intermediate products such as textiles.

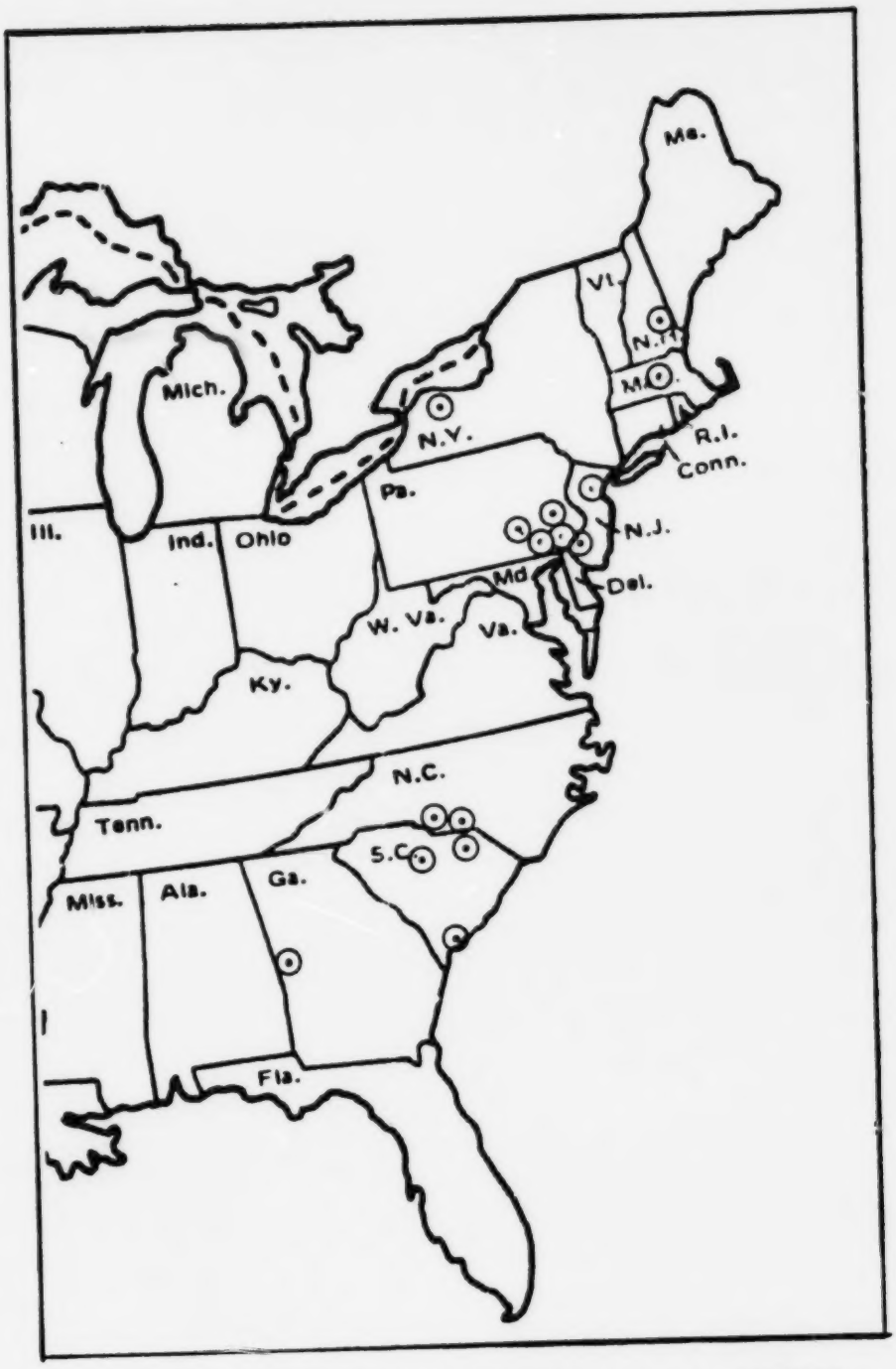

FIGURE A-1: GEOGRAPHICAL DISTRIBUTION OF U.S. ASBESTOS TEXTILE MANUFACTURING PLANTS

TABLE A-1

U.S. ASBESTOS TEXTILES MANUFACTURING FIRMS AND PLANTS

Firm	Location	Estimated Number of Production Employees*
Raybestos-Manhattan, Inc.	Mannheim, Pa.	300
	Marshville, N.C.	200
	N. Charleston, S.C.	500
Southern Asbestos Company	Charlotte, N.C.	300
	Bennettsville, S.C.	200
Amatex Corporation	Meredith, N.H.	200
	Norristown, Pa.	300
Uniroyal, Inc.	Hogansville, Ga.	300
Uniroyal Fiber & Textile Co.	Winnsboro, S.C.	200
Johns-Manville Corp.	Manville, N.J.	150
Atlas Textile Co.	N. Wales, Pa.	125
Asbestos Textile Co.	N. Brookfield, Mass.	100
Asten-Hill Mfg. Co.	Philadelphia, Pa.	100
Garlock, Inc.	Palmyra, N.Y.	75
Nicolet Industries, Inc.	Ambler, Pa.	50
TOTAL		3,100

*Contractor's Estimates

By all accounts, the asbestos textiles industry is very mature, most of the operating plants being over 50 years old, with equipments, machinery, and technology of the same age. The Norristown, Pa. plant of Amatex, the Ambler, Pa. plant of Nicolet Industries, Southern Asbestos Company at Bennettsville, S.C. and Raybestos-Manhattan at Marshville, N.C. are probably the youngest crop of plants, and they average over 25 years of age. All things being equal, it is expected that very few, if any, new plants will come on-stream in the next 5 to 10 years. Similarly, no major technological breakthrough is anticipated that would alter the general complexion of the industry.

As indicated previously, a number of the major plants manufacture textiles for captive consumption at the same plant or another plant within the same corporate family. However, where such internal consumption occurs, it is generally restricted to the manufacture of friction or packing materials. For instance, Southern Asbestos company's facilities in Charlotte, N.C. and Bennettsville, S.C. are sources of raw materials for friction material plants in Huntington, Indiana and Richmond, Ky. Except in cases of such internal consumption, most asbestos textile plants sell their products to manufacturers of finished products that are resistent to heat, fire, acids and mechanical abrasion.

4: EMPLOYMENT

Total employment in the asbestos textiles industry has been derived from the basic data in Table A-1, adjusted by a factor of about 1.3 to account for salaried and supervisory/management employees. Total industry employment is estimated at 4,000 to 4,500 with the follow distribution:

# of Employees/Plant	# of Plants	Total Employment in Range
Less than 150	5	585
150-299	5	1,235
300-500	5	2,210

Plants with 300 or more employees, while accounting for only 33 percent of the manufacturing facilities, contribute about 55 percent of the industry employment, whereas the five smallest plants (33% of total number) account for only about 15 percent.

5: PRODUCTION

The value of 1973 shipments of asbestos textiles is estimated at about $44.5 million. The following represent judicious estimates of its breakdown by companies:

Raybestos-Manhattan, Inc.	$13.4 million	(30%)
Southern Asbestos Company	$13.4 million	(30%)
Amatex Corporation	$ 8.0 million	(18%)
Uniroyal	$ 2.2 million	(5%)
All others	$ 7.5 million	(20%)

Thus, in terms of shipments, the four largest firms (operating 8 plants) account for 83 percent, while the remaining 7 plants have an average annual shipment of $1 million each in asbestos textiles.

6: WATER UTILIZATION AND DISCHARGE

Compared to most manufacturing operations, asbestos textiles production involves relatively little water consumption. In fact, neglecting sanitary waste water, the largest potential sources of water effluents are the wet air pollution control devices, such as scrubbers, which are employed in a limited number of plants to control dust emissions from the plants to the atmosphere. Fortunately, wet scrubbing is becoming increasingly superseded by fabric filtering devices which are considered superior from a performance as well as environmental standpoint.

One of the few phases of textiles manufacture that involve significant utilization and discharge of process water is in cloth finishing (coating) operations where water-soluble coatings are involved.

The aggregate potential effluent discharge (sanitary, process, and emissions control) from asbestos textiles manufacturing probably averages about 250 gpd/ton of product, equivalent to an annual rate of about 5 million gallons for the entire industry.

Except for textile plants that are part of large multi-product facilities, whose composite effluents are treated within the plant premises prior to discharge or recirculation, the usual industry practice is to discharge most raw effluents, at some fee, into adjoining municipal sewer systems for treatment. In such cases, the economics apparently do not justify installation and operation of an independent water treatment system.

7: FINANCIAL PROFILE

(1) Manufacturing Economics: It is recognized that the costs of manufacturing in the asbestos textiles industry, as in most other manufacturing activities, would depend on, among other factors, the plant size in question, its product mix (including non-textiles and non-asbestos manufacturing), sources of raw materials, and corporate organizational structure.

Recognizing but discounting the probable deviations from the norm due to the above effects, the following synthetic financial balance is postulated as probably representative of the 1973 experience of an "average" asbestos textiles manufacturing plant:

TOTAL SHIPMENT - 5 million lbs.		
REVENUE		$6.65 million
COSTS:		
Materials & Supplies	$3.26 million	
Labor & Maintenance	1.05 million	
S.G.&A.*	1.75 million	
Total Operating Costs	$6.06 million	$6.06 million
OPERATING MARGIN		$0.59 million
DEPRECIATION & AMORTIZATION		$0.20 million
NET PRE-TAX MARGIN		$0.39 million
Pre-Tax Margin as Percent of Sales		5.8 percent
TAXES (50%)		$0.20 million
AFTER-TAX MARGIN		$0.20 million
As Percent of Sales		3.0 percent

On the basis of the above estimates, it is apparent that raw materials and labor contribute a high percentage of the cost of manufacturing asbestos textiles--71 percent. Secondly, since most plants and equipments are over 25 years old, the depreciation allowance is low--3 percent of revenue. Thirdly, it is evident that asbestos textiles manufacturing is a low cash-flow low-profit enterprise, and any adverse economic perturbation, (including higher labor and materials costs and the costs of environment control), which increases manufacturing costs by over 6% without a corresponding product price increase may threaten the survival of the industry.

(2) Salvage Values of Assets and Constraints on Financing Additional Capital Assets: The discussions in this section are general in nature and are applicable to all three asbestos products segments which form the subject of this study. Accordingly, the issues discussed here will not be considered again in the friction materials and gaskets/packings/insulations sections.

There is little information available which could be directly and meaningfully applied to the question of salvage values of assets in the event of possible shut-down of facilities arising from the incremental pollution abatement investment and operating costs.

* Sales, General and Administrative expenses, including corporate overhead expenses.

Some perspective on maximum possible salvage values of plant and equipment per unit of production capacity may be obtained by examining census data on net plant and equipment book value, updated and refined in conjunction with actual company financial statements, including an allowance for working capital tied up in individual plant operations. Preliminary indications are that salvage value would be on the order of 10-15% of the value of shipment.

As for the constraints on financing additional capital assets, these fall into several categories, namely managerial, financial, competitive, and regulatory.

With respect to marageria1 constraints, it is management's task to choose from among investment alternatives and to decide on the optimum utilization of the corporation's resources and borrowing power, and to formulate and implement plans accordingly. The funds available to the corporation include, of course, its total cash generation, its borrowing power, and ability to raise additional equity capital. The realistic constraints here are the costs of capital vis-a-vis the expected rates of return on its investment.

With respect to financial constraints, a corporation's earnings and cash flow are generally programmed to meet dividend reinvestment and debt service requirements. When external financing is required, there are many considerations dictating the type and amount--e.g., existing commitments which carry with them an obligation with respect to maintenance of certain ratios.

Concerning competitive constraints, a process breakthrough which significantly lowers production costs may dictate that capital investments be made defensively by competitors and offensively by the innovative firm. If pollution costs are so onerous and if competitive market conditions do not permit pass-on to customers or taxpayers, a firm may elect not to spend the money, assuming it could achieve a greater return elsewhere.

Finally, with respect to regulatory constraints, the financing of additional capital assets may be, and usually is, influence by tax laws, particularly those regarding accelerated depreciation, depletion, and foreign ownership versus tax considerations. Pollution control regulations add a new dimension.

8: PRICES

As discussed previously, the after-tax profit margin associated with asbestos textiles production is only on the order of 3 percent of sales. Such low margins may be due, in part, to the fact that textiles, for most applications, are regarded as intermediate rather than final products with the high value-added phase of fiber-to-product conversion still downstream of the textile stage. Secondly, the advent of some

man-made substitute materials that are price-performance-competitive with asbestos textiles in some of its applications has helped to restrain price escalations, even in the face of rising materials and labor costs to the textiles manufacturers. Such competitive materials include fiberglass, which is available in the form of continuous filament at a cost quite comparable to that of the better grades of spinning asbestos fiber.

Given the escalating raw materials costs now impacting the textiles industry, and recognizing the industrial value of the products of this industry, and the fact that the industry cannot afford to absorb future cost increases, it is likely that such additional costs (which include the cost of environmental quality control) will be passed-on to textiles consumers. This assertion in no way contradicts the previously acknowledged existence of potential substitute materials, in view of the fact that the market appeal of these substitutes is presently very limited. Moreover, current upward price pressures on both asbestos textiles and the aforesaid potential substitutes have not changed the price-performance factor in favor of the substitutes.

B: ASBESTOS FRICTION MATERIALS

The friction materials segment of the asbestos manufacturing industry includes products that find extensive use in the fields of transportation, mining, and heavy construction. Specific applications are of drum, disc, outer jaw, and hand brakes, dry and oil-immersed clutches, and facings for automatic transmission discs.

The various types of friction materials can be classified according to structure and method of fabrication. Molded brake linings or clutch facings encompass all products that are preformed under pressure in molds or between rolls. Paper and millboard friction materials include plied asbestos papers that are impregnated prior to or subsequent to plying and asbestos papers that are formed from pulp to which friction compounds have been added. Woven linings are constructed of resin-impregnated woven asbestos fabrics that are hot-pressed or calendered and baked to form linings.

Estimates by the U.S. Bureau of Mines and the Asbestos Information Association of North America (AIA/NA) place the annual U.S. requirement of asbestos fiber for this application at around 10 percent of the total consumption--equivalent to about 80,000 short tons in 1972. The recent trend in the value of shipments of asbestos friction materials is shown in Table B-2.

1: MANUFACTURING PROCESSES AND TECHNOLOGIES

Many materials, including some whose exact roles are regarded as proprietary knowledge, are used in varying quantities in the manufacture of friction materials. Dry processes normally begin in ribbon blenders where bonding agents, metallic constituents, and asbestos fibers are mixed for production of molded linings. The major binder is a "b" stage resin that is thermoset when fully cured, but is also intermediately set in the partially-cured condition. A uniform layer of the material is heated sufficiently, under pressure, to cause the resin to flow and set but not be fully cured. The resulting flat sheet is removed, cut into product-sized segments, reheated to soften the resin, and formed to the proper arc by cold molding. A final baking of the segments in compression molds at 1,000 to 4,000 psi to retain the shape converts the resin to a thermoset or permanent condition.

In a variation of the wet-board process, wet-mixed molding materials are usually combined in a blender from which the mixture is fed to a paper machine where the material is placed in a preform which carries a perforated metal screen on one side. When suction is applied to the outside of the screen, solvent is removed and a deposit of the molding mixture remains on the screen. This is then transferred to a revolving cylinder, where it builds up to the desired product thickness. The deposit is removed from the cylinder, dried, but into product-sized segments, saturated in a liquid binder, and either air-dried or oven-dried to remove the solvents.

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TABLE B-2

TREND IN VALUE OF SHIPMENTS OF ASBESTOS FRICTION MATERIALS

Year	Value of Shipments (10^6)
1963	117.7
1967	144.4
1971	179.1
1972	181.6
1973	205*

*Preliminary

SOURCES: U.S. Bureau of the Census, AIA/NA, and Contractor's Estimates

Woven brake linings and clutch faces are made in several ways. One method is to weave a heavy tape of desired width and in considerable length, impregnate it with resins and other materials to impart the desired frictional characteristics, and supply it in rolls to distributors and users who can cut it to suit their requirements. Another method is to weave the asbestos yarn into sheets of fabric up to a few feet wide and of the desired thickness, impregnate the sheets, and fix the impregnate by heat treatment and then slit the sheets into long strips of the desired width which are then supplied to the trade in the form of rolls.

2: FIRMS

No reliable statistics are available regarding the number of firms involved in asbestos friction materials manufacture. The larger firms include not only the essentially captive producers such as the Delco-Moraine and Inland Divisions of General Motors Corporation and The Cycleweld Division of Chrysler Corporation, but also diversified industrial product manufacturers such as Raybestos-Manhattan, Inc. and Bendix Corporation. In addition, several smaller, typically single-plant firms manufacture friction products for both the original equipment and replacement markets.

Table B-3 is a listing of the important firms in the industry, along with their plant locations and the estimated number of production employees involved in friction materials manufacturing.

3: PRODUCTION

As shown in Table B-2, the 1973 value of domestic shipments of asbestos friction products was about $205 million, up about 13 percent from the prior year. The estimated distribution of these sales among the major manufacturers is depicted in Table B-4, along with the percentages of corporate sales represented by friction materials. Clearly, Raybestos-Manhattan, Inc., with annual friction materials sales estimated at about $115 million, is the industry leader. The exact order of the other major producers is not so certain, but they are thought to be as follows:

Bendix Corporation
Delco-Moraine Division of General Motors Corporation
Abex Corporation
H. K. Porter Company
Cycleweld Division of Chrysler Corporation

The above firms probably account for 90 to 95 percent of the total production of friction products. This ratio is consistent with the historical pattern for the industry, which indicates that in the 1954 to 1967 period, the eight largest firms accounted for between 86 and 91 percent of the industry's value of shipments. Furthermore, these historical data suggest that about 99 percent of the shipments were usually made by the 20 largest companies.

TABLE B-3

U.S. MANUFACTURERS OF ASBESTOS-BEARING FRICTION MATERIALS

Company	Plant Location	Approximate Number of Production Employees*
Raybestos-Manhattan, Inc.	Stratford, Conn.	1,000
	Mannheim, Pa.	900
	Crawfordsville, Ind.	500
	Fullerton, Calif.	200
Bendix Corporation	Troy, N.Y.	600
	Cleveland, Tenn.	250
General Motors Corp.	Delco-Moraine Div. Dayton, Ohio	300
	Inland Division Dayton, Ohio	200
Abex Corporation	Cleveland, Ohio	200
	Troy, Michigan	175
	American Brakeblok Division Winchester, Va.	150
H. K. Porter Co.	Huntington, Indiana	200
	Richmond, Ky.	225
Chrysler Corporation	Cycleweld Division Trenton, Michigan	200
Borg Warner Corporation	Spring Division Bellwood, Ill.	150
Maremont Corporation	Grizzly Products Division Paulding, Ohio	150
Carlisle Corporation	Ridgeway, Pa.	125
Forcee Mfg. Corporation	Tappahannock, Va.	100
World Bestos Co.	New Castle, Ind.	100
Scandura, Inc.	Charlotte, N.C.	100
Gatke Corporation	Warsaw, Ind.	100
Mar Pro Corporation	Grizzly Brake Division Chicago, Ill.	100
Standco Industries	Houston, Texas	100
Auto Friction Corp.	Lawrence, Ma.	75
Brassbestos Mfg. Corp.	Patterson, N.J.	75
Southern Friction Material Co.	Charlotte, N.C.	75
L. J. Miley Co.	Chicago, Ill.	75
Auto Specialties Mfg. Co.	St. Joseph, Mich.	75

TABLE B-3 CONTINUED

U.S. MANUFACTURERS OF ASBESTOS-BEARING FRICTION MATERIALS

Company	Plant Location	Approximate Number of Production Employees*
National Friction Products Corp.	Logansport, Ind.	70
Reddaway Mfg. Co.	Newark, N.J.	50
Molded Ind. Friction Corp.	Prattville, Ala.	50
Royal Ind. Brake Products, Inc.	Danville, Ky.	50
Lasco Brake Products Co.	Oakland, Calif.	50
California Blok Co.	Gardena, Calif.	50
MGM Brakes, Inc.	Cloverdale, Calif.	50
Wheeling Brake Block Mfg. Co.	Bridgeport, Ohio	40
Baldwin-Ehnet Hill, Inc.	Trenton, N.J.	40
Thiokol Chemical Corp.	Trenton, N.J.	30

*Contractor's estimates of number employed in friction materials manufacture in 1973.

TABLE B-4

ESTIMATES OF DISTRIBUTION OF 1973 SALES OF ASBESTOS FRICTION MATERIALS BY THE MAJOR MANUFACTURING COMPANIES

Company	Estimated 1973 Sales, $MM (all products)	Sales* of Friction Materials, $MM	% of Firm's Total Sales
Abex Corp.	25	20+	>80%
Bendix Corp.	2,212	33	<2
Delco-Moraine/Inland Divisions of General Motors	N/A	20-25	N/A
H. K. Porter Co.	270	16	6
Raybestos-Manhattan, Inc.	175	115	66
All others	14	24	
TOTAL		228-233	

N/A - Not Available

SOURCE: Contractor's estimates

*May differ from value of shipments as reported by the Bureau of the Census due to differences in definition and reporting coverage.

4: EMPLOYMENT

About 77 percent of the estimated 7,000 production workers listed in Table B-3 are thought to be employed by the eight largest firms. Again, this is quite consistent with the U.S. Bureau of the Census statistics indicating historical figures over 70 percent. Inclusive of salaried and other management personnel, the friction materials industry probably employs a total of about 9,100.

5: PLANTS

The average total number of employees per plant is on the order of 225, indicating that the typical friction materials manufacturing facility is relatively small in comparison with other industrial manufacturers. Its annual shipments would be valued at about $5.4 million, yielding an average shipment per employee of about $24,000 per year.

As would be expected of a mature industry, most of the plants and equipments are old, usually over forty years of age with the possible exception of newer captive facilities belonging to the automobile manufacturers. Production processes have changed only marginally over the years, and labor rather than capital intensity appears to be the norm in most of the older plants.

Figure B-2 shows the geographical dispersion of friction materials plants in the U.S. Not surprisingly, they tend to be concentrated in and around the major metropolitan centers of the Northeast and the Midwest, with a few plants located in California to primarily cater to the needs of the automobile assembly plants in that part of the country.

6: WATER UTILIZATION AND DISCHARGE

To all intents and purposes, the friction products industry may be conceived as an essentially dry industry, generating no significant process waste water. What water is generated is likely to be either of the non-contact (cooling) type, or sanitary waste water, or waste water from wet particulate (dust) collection systems such as scrubbers. A few plants may also generate waste water from solvent recovery operations.

Perhaps the principle exceptions to these generalizations would be those plants that are integrated backward into paper and millboard friction product manufacturing. However, such plants are more aptly considered as primarily paper and millboard producers and are therefore outside the scope of the present consideration.

7: FINANCIAL PROFILE

(1) Manufacturing Economics: The following synthetic annual profit/loss statement has been developed as probably applicable in 1973 to an average friction materials manufacturing plant. In considering these data, it is important to bear in mind that the total revenue and the

FIGURE B-2: GEOGRAPHICAL DISPERSION OF U.S. FRICTION MATERIALS PLANTS

contribution of each cost item to the total manufacturing cost is a strong function of the product mix and therefore the manufacturing practices of a given plant. For instance, it is recognized that the proportion of total cost due to materials and supplies would, of necessity, vary depending on whether a plant's output is weighted in favor of woven as opposed to molded products, or brake linings rather than clutch and transmission facings.

REVENUE		$5.4 million
COSTS:		
Materials & Supplies	$2.59 million	
Labor & Maintenance	$1.24 million	
S.G.&A.	$1.08 million	
Total Operating Costs	$4.91 million	$4.91 million
OPERATING MARGIN		$0.49 million
DEPRECIATION & AMORTIZATION		$0.162 million
NET PRE-TAX MARGIN		$0.328 million
Pre-Tax Margin as Percent of Sales		6.0 percent
TAXES (50%)		$0.164 million
AFTER-TAX MARGIN		$0.164 million
As Percent of Sales		3.0 percent

(2) Prices: The above balance suggests that there is relatively little profit in the manufacture of friction products. In addition to escalating materials and labor costs, there are important market factors serving to moderate product prices. For instance, it might ordinarily be expected that profitability would be much higher than indicated above, especially since a high proportion of the demand for friction products (75-90% for some plants, depending on product mix) goes to after-market, rather than original equipment sales. This is not necessarily the case, and it would appear that the profits are made by mark-ups at the next higher (distributor and dealer) levels. Furthermore, the fact that major automobile manufacturers are involved in the business could tend to establish a defacto price ceiling which independent producers would not ordinarily violate without jeopardizing their shares of the market.

In addition to the foregoing general considerations, sales of automotive friction products are obviously dependent on Detroit product design and OEM specifications, captive manufacturing vs. outside procurement strategy, and, of late, federal transportation safety standards and regulations. But these factors notwithstanding, it is believed that as long as the demand for friction products remains strong, especially in the after-market sector, most manufacturers could conveniently pass-on cost increases of the size associated with meeting effluent control guidelines.

C: ASBESTOS GASKETS, PACKING AND INSULATING MATERIALS

Asbestos has been widely used for several decades as a constituent of gasketing (jointing) materials for joining non-moving parts, such as pipeline flanges and valves and for various forms of packings in such applications as steam, hydraulic and superheater systems where its high temperature, hot pit and acid resistance, etc., are advantageous.

Figures published by the Asbestos Information Association of North America (AIA/NA) show that the 1971 value of shipments of these products and the asbestos tonnages consumed are as follows:

Gaskets and packings	25,000 tons	$ 99.5 million
Insulations	16,000 tons	40.9 million
		$140.4 million

Apparently, these statistics are consistent with the 1967 Census of Manufactures data which showed the following breakdown of value of shipments:

Asbestos, asbestos-metallic, and asbestos-rubber gaskets	$ 62.1 million
Asbestos packing and insulations	63.2 million
	$125.3 million

The tempo of industrial activity, especially in the heavy mechanical machinery and chemical manufacturing sectors, would suggest a growth rate of about 3 to 5 percent per year in shipments of gaskets, packing, and insulating materials. Accordingly, 1973 aggregate sales are placed at between $148 million and $155 million.

1: FIRMS

As with most other sectors of the asbestos products manufacturing industry, no complete and reliable roster of the firms involved in manufacturing asbestos gaskets, packing, and insulating materials is available. Nevertheless, an incomplete list of some of the major manufacturers, is presented in Table C-5 with the eight most important members listed first, although not necessarily in order of size. It is estimated that these particular firms probably account for 55 to 65 percent of the total product shipments.

2: PLANTS

The estimated employment roster distribution of Table C-5 suggests that the average plant in this sector employs fewer than 100 production employees. Inclusive of other salaried and management personnel, total

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TABLE C-5

MAJOR U.S. MANUFACTURERS OF ASBESTOS GASKETS, PACKINGS, AND INSULATIONS

FIRM	LOCATION	ESTIMATED NUMBER OF PRODUCTION EMPLOYEES*
Raybestos-Manhattan, Inc.	Stratford, Conn.	150
Nicolet Industries	Ambler, Pa.	150
Johns-Manville Corp.	Manville, N.J.	150
Garlock, Inc.	Palmyra, N.Y.	125
Felt Products Mfg. Co.	Skokie, Ill.	105
McCord Corp.	Wyandotte, Mich.	100
Amatex Corp.	Norristown, Pa.	100
Gatke Corp.	Chicago, Ill.	100
Anchor Packing Co.	Philadelphia, Pa.	75
Vellumoid Division	Worcester, Mass.	75
Green, Tweed	N. Wales, Pa.	75
Crane Packing	Morton Grove, Ill.	75
F. D. Farnum	Lyons, Ill.	75
Sterling Packing & Gasket Co.	Houston, Texas	75
Detroit Gasket & Mfg. Co.	Detroit, Mich.	50
A. W. Chesterton	Everett, Mass.	50
Hercules Div. of Richardson Corp.	Alden, N.Y.	50
Braiding & Packing Works of America	Brooklyn, N.Y.	50
Sacomo Packing Co.	San Francisco, Calif.	50
Sepco	Birmingham, Ala.	40
Quality Gasket & Mfg. Co.	Clawson, Mich.	35
Armstrong Cork Co.	Braintree, Mass.	30
TOTAL		1,785

*Contractor's estimates.

employment is about 110, although it should be noted that other manufacturing activities at a given plant (both asbestos- and non-asbestos-related) generally tend to exaggerate the importance of the gaskets/packings/insulations sector. Value of shipments per average plant is estimated at about $4.2 million.

Because the listing of Table C-5 is considered far from exhaustive, representing only about 60% of the total shipments, any discussion of the geographical dispersion of plants based on Table C-5 is apt to be misleading. It can, however, be said that plants in this segment are concentrated in and around the major industrial centers.

3: WATER UTILIZATION AND DISCHARGE

Gaskets are conventionally manufactured by dry (non-water consuming) processes. After opening and cleaning, the fibers are mixed with the correct proportion of rubber and other mineral ingredients to a dough-like consistency and rolled out in calendars, where heat drives off the solvent and the action of the rollers compounds the constituents into a homogeneous sheet. Woven asbestos gaskets are preferred in cases where softness and pliability are desirable. In such cases, they are woven from yarn reinforced with fine brass wire and usually contain 10 to 20 percent of organic fibers. The porous woven fabric is subsequently impregnated with either rubber or plastic compounds.

Similarly, packings require no process water. Asbestos yarn is simply worked up into twisted or braided forms that are compressed into rings or into cloth which is subsequently coated with rubber compound and folded or bound into various forms of packing for high-pressure steam work.

4: FINANCIAL PROFILE

(1) Manufacturing Economics: Of the three major asbestos products-manufacturing segments considered--textiles, friction materials, and gaskets/packings/insulating materials--indications are that the gaskets group is probably the most economically profitable. The 1973 synthetic profit/loss statement for an average plant is postulated as follows:

REVENUE		$ 4.2 million
COSTS:		
Materials & Supplies	$1,676,000	
Labor & Maintenance	$ 890,000	
S.G.&A.	$1,040,000	
OPERATING MARGIN		$594,000
DEPRECIATION AMORTIZATION		$126,000
NET INCOME BEFORE TAXES		$468,000
Pre-Tax Margin as Percent of Sales		11 percent
TAXES (50%)		$234,000
AFTER-TAX MARGIN		$234,000
As Percent of Sales		5.5 percent

The estimated after-tax margin of 5.5 percent of sales, in comparison with the lower margins indicated for friction materials and textiles, is probably traceable to the high proportion of product sales that goes to after-market applications in high-value equipment. Accordingly, demand tends to be relatively price-insensitive, a factor which, under normal conditions, should make cost pass-on easy to accomplish.

(2) Prices: In projecting future price trends, it is essential to recognize the existence on the horizon of substitute non-asbestos materials whose price-performance posture might tend to improve as the price of asbestos-based gasketing/insulating materials increases. Graphitic packings, which are now used only in special applications, represent one such example. Furthermore, over the last few years, there has been a significant erosion of the braised seal packings market by mechanical seals, especially in nuclear power pump applications. These factors notwithstanding, it is thought that demand for asbestos gaskets/packing materials will continue to be brisk and at least commensurate with the level of growth in industrial activity projected for the rest of this decade. Accordingly, gaskets and insulating materials manufacturers should be able to pass-on moderate cost increases which could be attributed to compliance with the proposed effluent guidelines.

PART II: EFFLUENT CONTROL COSTS

II-A: WATER UTILIZATION AND DISCHARGE

II-B: CURRENT EFFLUENT TREATMENT PRACTICES

II-C: PROPOSED EFFLUENT STANDARDS AND TREATMENT TECHNOLOGIES

II-D: EFFLUENT CONTROL COSTS

A: WATER UTILIZATION AND DISCHARGE

Manufacture of the asbestos products which comprise the subject of this study--asbestos textiles, asbestos friction materials, and asbestos gaskets, packing and insulating devices--generally requires very little consumption of process water. For example, the only significant instances of process water utilization in textile manufacturing are the addition of moisture during weaving or braiding, and in the textile coating operations. Only in the latter process is any waste water generated. In friction products manufacturing, water is not a necessary process ingredient and is not directly used in manufacturing. Waste water may be generated in a few friction materials plants as a consequence of solvent recovery operations and in wet dust collection facilities used for air quality control in product finishing areas.

However, the latter waste water source is decreasing in significance as the popularity of dry dust collection units increases. As for gaskets, packing and insulating materials manufacturing, little or no process water is generally involved. Sheet gasket manufacturing may, however, include cooling and solvent recovery operations that generate waste waters.

Liquid effluent from asbestos textile coating generally results from clean-up and dumping of unused coating materials at the end of a run. Only two textile plants are known to generate such wastes, and in quantities not normally exceeding about 200 gallons per day. Both plants discharge their wastes into adjoining municipal sewer systems. Furthermore, one of these plants employs vapor absorption facilities for scrubbing solvent fumes from its drying oven exhausts. Such units, which generally use caustic soda solutions, are normally operated intermittently (once or twice a month) and require about 60,000 gallons of water per operation.

Solvent recovery effluents are known to be generated at only one sheet gasketing plant and one friction products plant. Waste volumes vary, depending on the type and size of equipment. The discharge is generally steady although not a direct function of the plant (asbestos materials) production rate. An effluent generation rate of about 10,000 gallons per day may be considered typical of such operations.

Wet dust collector effluent discharge rates generally range from about 50,000 to 150,000 gallons per day for the asbestos products manufacturing industry. Four friction materials plants have been identified as sources of such effluents.

In addition to the above sources of liquid effluents, there are two known pilot-plant operations that employ the so-called "dispersion processes" for asbestos yarn manufacturing and represent potential waste water sources. These are not commercial operations and are therefore excluded from further consideration on the premise that the

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lack of data relative to their potential commercial viability and effluent characteristics precludes any reliable comments as to the potential impact of the proposed effluent standards on these plants when and if they achieve commercialization.

B: CURRENT EFFLUENT TREATMENT PRACTICES

The industry characterization section of this study indicated the following approximate breakdown of plants involved in the manufacture of the subject asbestos products:

- Textiles:	11 firms	15 plants
- Friction Materials:	30 firms	38 plants
- Gaskets, etc.:	22 firms	22 plants

Of these facilities, it is believed that only eight commercial-scale plants could routinely discharge any liquid effluents from a total of 10 different sources. As shown in Table D-6, three of these sources are ascribable to textiles manufacturing (representing 13% of the known plants in this segment), one to sheet gaskets production (4% of the plants), and the balance to friction materials fabrication (equivalent to 17% of the plants). It should be observed also that one textiles plant and one friction materials plant have no water treatment facilities whatsoever; and two of the friction products plants have zero discharge. The two textiles plants (T-1 & T-2) and a friction material plant (FM-5) discharge their wastes into municipal sewer systems. For purposes of subsequent discussion and analysis, zero discharge plants and plants using municipal sewers (for which no effluent guidelines have yet been evolved) are removed from further consideration.

TABLE D-6

DESCRIPTION OF EFFLUENT SOURCES IN ASBESTOS PRODUCTS MANUFACTURING

Plant Code	Product	Effluent Source	Current Treatment	Effluent Discharge Point
T-1	Textiles	Coating	None	Municipal sewer
T-2	Textiles	Coating and fume scrubber	Two-stage lagoon	Municipal sewer
S-1	Sheet gaskets	Solvent recovery	Lagoon	Surface water
FM-1	Friction Materials	Wet scrubber	Lagoon	Zero discharge
FM-2	" "	" "	Sedimentation	Surface water
FM-3	" "	" "	Two-stage lagoon	Surface water
FM-4	" "	" "	Lagoon	Surface water
FM-5	" "	Solvent recovery Dust scrubber	None Lagoon	Municipal sewer Zero discharge
FM-6	" "	Dust scrubber	Chemical precipitation with other wastes	Surface water

SOURCE: Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textiles, Friction and Sealing Materials Segment of the Asbestos Product Manufacturing Point Source Category. Sverdrup and Parcel and Associates, Inc., St. Louis, Mo. August, 1974.

C: PROPOSED EFFLUENT STANDARDS AND TREATMENT TECHNOLOGIES

In formulating the effluent treatment standards and treatment technologies applicable to the subject segments of the asbestos products manufacturing industry, the Development Document for Effluent Limitation Guidelines did not consider it meaningful to propose individual standards for the textiles, friction materials, and gaskets/packings/insulations categories. Since the effluent characteristics are more a function of product finishing and peripheral operations, rather than the primary manufacturing activities, a guidelines system based on these finishing and peripheral processes was deemed more appropriate. Accordingly, standards and applicable technologies were developed on the basis of the following unit operations:

- Coating or finishing of asbestos textiles
- Solvent recovery operations
- Vapor absorption (fume scrubbing)
- Wet dust collection

The proposed standards considered the chemical, physical, and biological characteristics of the effluents associated with each of the above operations, including:

- Suspended solids
- pH
- Effluent temperature
- Biological oxygen demand (BOD)
- Dissolved solids
- Heavy metals
- Phenols
- Nitrogen
- Phosphorous
- Chemical oxygen demand (COD)

Suspended solids and chemical oxygen demand (COD) are probably the most important parameters of asbestos products manufacturing effluents. The proposed standards did not include suspended asbestos particles in the list of important effluent parameters because it is not generally present in the wastes under consideration, except perhaps for the wet dust collection category. Even in this case, it is thought that the asbestos fibers are not freely dispersed in the effluent, but are encased firmly within the dust particles and as such cannot be detected by normal microscopic techniques. Furthermore, pollutants in other non-process wastes such as non-contact cooling water, boiler blowdown, steam condensate, and wastes from water treatment facilities, are specifically excluded.

Shown in Table D-7 are the effluent quality standards proposed under the best practicable control technology (BPT), best available control technology (BAT), and new source performance (NSP) standards provisions of the 1972 Federal Water Pollution Control Act Amendments. BPT and BAT

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standards must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. The new source standards apply to those sources of waste water whose construction commenced after the publication of these standards.

Table D-8 shows the technologies proposed for attainment of the above standards. For textile coating effluents, the BPT and BAT standards can be achieved by containment of dumped and spilled coating materials and by adoption of dry techniques for equipment cleaning and other housekeeping activities. All waste would be containerized for salvage, used as a fuel substitute, or disposed in a controlled sanitary landfill. NSP standards may be attained by designing new facilities for containment of all wastes.

Treatment of solvent recovery effluents for compliance with the BPT, BAT and NSP standards would involve, in sequence, cooling where necessary, addition of supplemental nutrients, treatment by the extended aeration version of the activated sludge process, and disposal of excess sludge in a municipal sewage treatment plant.

The control technology required to achieve the BPT and BAT standards in the vapor absorption subcategory is fume incineration. This would involve replacement of vapor absorption units with fume incinerators to oxidize the vapors in air exhausted from the drying ovens. NSP standards would require recovery of all vapor and fume emissions for reuse or as fuel substitutes.

For the wet dust collection subcategory, sedimentation is the recommended technology for achieving the BPT standards. To meet the BAT and NSP standards, it is recommended that in place of wet scrubbers, baghouses, or other effective dry collection devices, should be adopted for dust control purposes.

An important parameter necessary for subsequent estimation of the cost of meeting the proposed effluent standards is the representative effluent generation rate characteristic of each source subcategory. These are shown in Table D-9.

TABLE D-7

PROPOSED EFFLUENT QUALITY STANDARDS FOR BPT,** BAT, AND NSP STANDARDS

Waste Source		Discharged Effluent Standards*		
		COD	Suspended Solids	pH
		(lbs. of pollutant/1000 lb. of finished product)		
I. BPT Solvent recovery	Max.	0.30	0.18	6 - 9
	Avg.	0.18	0.09	
Textile coating		Zero discharge of process wastes		
Vapor absorption		Zero discharge of process wastes		
Wet dust collection	Max.	N/A	5.0*	6 - 9
	Avg.		2.5*	
		(lbs. of pollutant/10^6 standard cubic feet of air scrubbed)		
II. BAT Solvent recovery	Max.	0.30	0.18	6 - 9
	Avg.	0.18	0.09	
Textile coating		Zero discharge of process wastes		
Vapor absorption		Zero discharge of process wastes		
Wet dust collection		Zero discharge of process wastes		
III. NSP Solvent recovery	Max.	0.30	0.18	6 - 9
	Avg.	0.18	0.09	
Textile coating		Zero discharge of process wastes		
Vapor absorption		Zero discharge of process wastes		
Wet dust collection		Zero discharge of process wastes		

* Maximum average of daily values for any period of 30 consecutive days.
** BPT = Best practicable technology currently available;
BAT = Best available technology economically achievable;
NSP = New source performance standards.

SOURCE: Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textiles, Friction and Sealing Materials Segment of the Asbestos Product Manufacturing Point Source Category. Sverdrup and Parcel and Associates, Inc., St. Louis, Mo. August, 1974.

TABLE D-8

EFFLUENT TREATMENT TECHNOLOGIES FOR ATTAINING THE PROPOSED STANDARDS

STANDARD	WASTE SOURCE	
BPT*	Textile Coating	Waste containerization for salvage, subsequent fuel use, or landfill disposal.
	Solvent Recovery	Cool wastes (if necessary), add supplemental nutrients, and extended aeration version of activated sludge process.
	Vapor Absorption	Fume incineration.
	Wet Dust Collection	Sedimentation.
BAT*	Textile Coating	Same as for BPT.
	Solvent Recovery	Same as for BPT.
	Vapor Absorption	Same as for BPT.
	Wet Dust Collection	Replacement of wet scrubbers with baghouses or other dry collection devices.
NSP*	Textile Coating	Original plant design for waste containment.
	Solvent Recovery	Either biological treatment (as for BPT), or carbon absorption, or reverse osmosis.
	Vapor Absorption	Recovery for reuse (or as fuel substitute) of all vapor or fume emissions.
	Wet Dust Collection	Baghouse or other dry dust collection devices.

SOURCE: Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textiles, Friction and Sealing Materials Segment of the Asbestos Product Manufacturing Point Source Category. Sverdrup and Parcel and Associates, Inc., St. Louis, Mo. August, 1974.

*BPT = Best practicable technology currently available;
BAT = Best available technology economically achievable;
NSP = New source performance standards.

TABLE D-9

EFFLUENT GENERATION RATES FROM REPRESENTATIVE SOURCE CATEGORIES

Source Category		Waste Discharge Rate (gals./day)
Textile Coating		200
Solvent Recovery		10,000
Vapor Absorption		60,000*
Wet Dust Collection:	small	50,000
	medium	100,000
	large	150,000

SOURCE: Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textiles, Friction and Sealing Materials Segment of the Asbestos Product Manufacturing Point Source Category. Sverdrup and Parcel and Associates, Inc., St. Louis, Mo. August, 1974.

* Total discharge per operating period (2 periods per month).

D: EFFLUENT CONTROL COSTS

The basic cost estimates associated with meeting the BPT, BAT, and NSP effluent standards by the asbestos products manufacturing industry are taken from the Development Document for Effluent Limitations Guidelines for this industry. Effluent treatment cost estimates were based on the premise that the only basic variable determining the costs to each plant and effluent source was the volume of waste water generated. The age and size of the production facilities, level of implementation of in-plant control, and local non-water quality environmental factors were important only insofar as they might determine the volume of generated effluents.

1. Capital Investments for Representative Sources: Table D-10 shows the investment cost estimates for the various representative effluent sources. Investment costs are defined as the capital expenditures required to bring the effluent treatment or control technology into operation. They include, as appropriate, the costs of excavation, concrete, mechanical and electrical equipment installed, piping, engineering design services, construction supervision and related costs. The costs of the control facilities were estimated on the basis of minimal space requirements. As such, no additional land costs were included.

2. Annual Costs for Representative Sources: These costs are shown in Table D-11 and include:

- Capital costs, calculated as 8% of the total capital investment.
- Depreciation on a straight line basis, the applicable duration being a function of the treatment system involved.
- Operation and maintenance costs, which include labor, materials, solid waste disposal, effluent monitoring, administrative expenses, taxes, and insurance.
- Energy and power costs estimated on the basis of $0.025 per Kwh.

3. Costs to Operating Plants: The cost estimation methodology discussed above was applied specifically to effluent-discharging plants in each asbestos product sub-category, taking cognizance of each plant's existing effluent treatment facilities (if any) and the volume of effluents generated. Zero-discharge facilities and plants discharging into municipal sewer systems are excluded from consideration.

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Table D-12 and D-13 show respectively the capital investment and annual costs incurred by the relevant effluent-discharging plants in meeting the proposed standards. Since all the relevant friction materials plants currently meet the BPT standards, only the gasket plant would incur any capital and annual operating expenditures in meeting these standards. As for the BAT standards, all the listed plants would incur some costs.

In the aggregate, capital investments for these segments of the asbestos manufacturing category would equal $80,300 to meet the BPT standards, plus $471,900 to meet the BAT guidelines. As for annual costs, these amount to $35,500 and $91,000, respectively (all figures in 1973 dollars).

TABLE D-10

CAPITAL INVESTMENT ESTIMATES FOR EFFLUENT SOURCE CATEGORIES (REPRESENTATIVE SOURCES)

Effluent Source		Capital Investment (1971-$) to Satisfy: BPT Standards	BAT Standards (in addition to BPT costs)
Textile Coating		2,000	0
Solvent Recovery		73,000	0
Vapor Absorption		152,000	0
Wet Dust Collection:	Small	44,000	43,000
	Medium	64,000	94,000
	Large	83,000	146,000

SOURCE: Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textiles, Friction and Sealing Materials Segment of the Asbestos Product Manufacturing Point Source Category. Sverdrup and Parcel and Associates, Inc., St. Louis, Mo. August, 1974.

TABLE D-11

ANNUAL COSTS FOR REPRESENTATIVE SOURCES
OF ASBESTOS MANUFACTURING EFFLUENTS

Source Category	Cost Item	Annual Costs (1971 $) to Satisfy: BPT Standards	BAT Standards (in addition to BPT costs)
Textile Coating	Capital	160	--
	Depreciation	200[1]	--
	Operating & Maintenance	8,000	--
	Energy & Power	0	--
	TOTAL	8,360	--
Solvent Recovery	Capital	5,900	--
	Depreciation	2,900[3]	--
	Operating & Maintenance	12,500	--
	Energy & Power	11,000	--
	TOTAL	32,300	--
Vapor Absorption	Capital	12,200	--
	Depreciation	15,200[1]	--
	Operating & Maintenance	1,800	--
	Energy & Power	16,800	--
	TOTAL	46,000	--
Wet Dust Collection:			
Small	Capital	3,500	3,400
	Depreciation	1,800[3]	1,700[3]
	Operating & Maintenance	7,700	4,300
	Energy & Power	4,000	0
	TOTAL	17,000	9,400
Medium	Capital	5,100	7,500
	Depreciation	2,600[3]	4,700[2]
	Operating & Maintenance	12,000	6,100
	Energy & Power	5,200	0
	TOTAL	24,900	18,300
Large	Capital	6,600	11,700
	Depreciation	3,300[3]	7,300[2]
	Operating & Maintenance	16,000	8,500
	Energy & Power	6,500	0
	TOTAL	32,700	27,500

SOURCE: Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textiles, Friction and Sealing Materials Segment of the Asbestos Product Manufacturing Point Source Category. Sverdrup and Parcel and Associates, Inc., St. Louis, Mo. August, 1974.

1 10-year depreciation period
2 20-year depreciation period
3 25-year depreciation period

TABLE D-12

CAPITAL INVESTMENTS REQUIRED BY EFFLUENT-DISCHARGING PLANTS

Plant Code	Capital Costs ($) To Meet:			
	BPT Standards		BAT Standards (incremental)	
	(1971 $)	(1973 $)*	(1971 $)	(1973 $)*
S-1	73,000	80,300	0	0
FM-2	0	0	146,000	160,600
FM-3	0	0	94,000	103,400
FM-4	0	0	43,000	47,300
FM-6	0	0	146,000	160,600
TOTAL	73,000	80,300	429,000	471,900

TABLE D-13

ANNUAL COSTS INCURRED BY EFFLUENT-DISCHARGING PLANTS

Plant Code	Annual Costs ($) To Meet:			
	BPT Standards		BAT Standards (incremental)	
	(1971 $)	(1973 $)*	(1971 $)	(1973 $)*
S-1	32,300	35,500	0	0
FM-2	0	0	27,500	30,300
FM-3	0	0	18,300	20,100
FM-4	0	0	9,400	10,300
FM-6	0	0	27,500	30,300
TOTAL	32,300	35,500	82,700	91,000

SOURCE: Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textiles, Friction and Sealing Materials Segment of the Asbestos Product Manufacturing Point Source Category. Sverdrup and Parcel and Associates, Inc., St. Louis, Mo. August, 1974.

*1973 figures assume an average cost escalation of 10 percent over 1971.

PART III: ECONOMIC IMPACT ANALYSIS

III-A: METHODOLOGY

III-B: ECONOMIC IMPACT ANALYSIS

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A: METHODOLOGY

Previous analysis of the financial profiles of the various segments of the asbestos products manufacturing industry synthesized the following profit margins (as a percentage of sales):

	Pre-tax	After-tax
Asbestos textiles	5.8%	3.0%
Friction materials	6.0%	3.0%
Gaskets/packings/insulations	11.0%	5.5%

To a first approximation, it is assumed that these figures are applicable across the board to each item of the product mix manufactured at a plant. Thus, a textiles plant is assumed to realize an identical margin of 5.8 percent of sales on yarn, cord, rope, thread, tape, wicks, and various fabrics.

Furthermore, it is assumed that any additional cost increases due to the proposed effluent standards, which the manufacturer cannot pass-on to the customer and therefore must absorb, ultimately comes out of the above profit margins. Clearly, as such cost increases approach and exceed these margins, the plant must make a determination as to the economic wisdom of continued operation, taking account also of several other impinging factors.

Indications are that, in general, the average profitability in these segments of the asbestos products manufacturing industry is low compared with the returns achieved by other manufacturing industries. It is therefore reasoned, for purposes of this analysis, that any additional water treatment costs closely approaching the above pre-tax margins would in general present a threat to the continued operation of a plant or product line. (Discussions with some industry sources suggest perhaps an even greater sensitivity than this for all product lines). Thus, for friction material facilities, if the projected additional annual water treatment costs necessary to meet any of the proposed standards approach 6.0 percent of a plant's value of sales of friction materials, that plant's continued production of these products would be regarded as jeopardized.

In those plants where the water treatment costs cannot be easily and directly attributed to a given product line or operation, these costs are assigned uniformly to all of the plant's products. Thus, in such circumstances, the additional costs associated with treatment of solvent recovery, vapor absorption, and wet dust collection effluents are distributed equally among all the products manufactured at these plants.

Tables D-14 and D-15 present estimates of the average annual value of sales of the base products at the respective effluent-discharging plants, as well as a representation of the additional annual costs (as

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a percentage of these sales) of meeting the BPT and BAT standards respectively. As indicated in Table D-13, water treatment costs, in 1973 dollars, are derived by escalation of the 1971 costs by 10 percent to reflect cost inflation between 1971 and 1973.

To ascertain and isolate specific financial impacts, one would ideally wish to examine the expected profitability of present or "baseline" operations versus that projected under BPT and BAT, other conditions initially held constant. One would also wish to compare the required capital expenditures with the cash flows available, and compare the ordinary capital investment which would be expected to be made over the same period with the expenditures made to meet BPT and BAT standards.

Additionally, one would then wish to examine the results in the context and from the perspective of each company's total business.

An effort was made to examine the various plant situations from these standpoints, to the extent that data and information were available. This examination included estimates of both operating margin and return on investment effects, as cross checks on the findings.

TABLE D-14

ANNUAL COSTS OF ACHIEVING BPT STANDARDS AS A FUNCTION OF SALES OF RELEVANT PRODUCTS

Plant	Base Products	Estimated Average Annual Sales* of Base Products (in millions) (1973 $)	Additional Costs to Meet BPT Standards (1973 $)	Costs (1973 $) as % of Sales
S-1	Sheet Gaskets	5.0	$35,500	0.7
FM-2	Friction Materials	2.4	0	0
FM-3	Friction Materials	3.6	0	0
FM-4	Friction Materials	1.7	0	0
FM-6	Friction Materials	60.0	0	0

TABLE D-15

ANNUAL COSTS OF ACHIEVING BAT STANDARDS AS A FUNCTION OF SALES OF RELEVANT PRODUCTS

Plant	Base Products	Estimated Average Annual Sales* of Base Products (in millions) (1973 $)	Additional Costs to Meet BAT Standards (1973 $)	Costs (1973 $) as % of Sales
S-1	Sheet Gaskets	5.0	0	0
FM-2	Friction Materials	2.4	$30,300	1.3
FM-3	Friction Materials	3.6	20,100	0.6
FM-4	Friction Materials	1.7	10,300	0.6
FM-6	Friction Materials	60.0	30,300	0.05

SOURCE: Company and Trade Reports and Contractor's Estimates.

*In cases where products are consumed captively, estimates reflect internal transfer prices.

B: ECONOMIC IMPACT ANALYSIS

(1) Financial Impact: The indications are that if any plants would be significantly impacted, it would probably be plants FM-2, and/or S-1. Such impacts would be only in respect to BAT standards, which implies that the time frame for capital expenditure is, approximately, 1980-1983, and the accounting for annual charges related to BAT would be post-1980.

To put this in some perspective at the plant level, the estimated incremental annual costs for these plants are on the order of $30,000-$35,000 per year, in 1973 dollar terms; and each plant has 100 or more employees and annual pre-tax operating earnings estimated to significantly exceed one hundred thousand dollars. Indications are that other things being equal the diminution of earnings, given present sales and earnings levels, could be in the range of 7 to 15 percent for these plants. However, assuming pre-tax profit margins in the range of 5 to 12 percent, indications are that the earnings diminution could be offset by very minor price increases (less than 2 percent). Moreover, the impact will be lower to the extent that there is real growth in the business into the 1980's since the level of earnings (in constant dollar terms) would be higher.

It is believed that the additional capital expenditure required to achieve the BAT standards at these plants would represent a minor portion of the existing investment; furthermore, indications are that the rate of expenditure in general will not be large in comparison with normal patterns.

On the basis of the estimates in Tables D-14 and D-15 and impact severity criteria set forth in Section III-A (i.e., costs should not too closely approach margin of sales), none of the discharging plants is regarded as being in danger of curtailing or terminating operations as a direct result of the proposed effluent limitation guidelines.

Table D-16 presents a summary in terms of estimated impact on return on investment, given the data available. The indications are that there is likely to be little financial impact from the proposed standards.

(2) Price Effects: On the basis of discussions with asbestos products manufacturers and other followers of the industry, there appear to be no legal or market constraints in the way of passing-on to the consumer cost increases of the magnitudes estimated as attributable to the proposed standards (maxima of 0.7 percent and 1.3 percent of sales to meet the BPT and BAT standards respectively).

It is reasoned that the industry segments will not be disposed to absorb these added costs in the face of other margin-depleting costs, such as those for energy, and given the already low after-tax margins realized. Accordingly, a price increase on the order of one percent may be imposed without serious customer resistance by the one gaskets plants incurring additional expenses to meet the BPT guidelines (Table D-14).

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But since no industry-wide follow-the-leader price increases are expected to materialize from this limited price action, the price effect of the BPT standards are projected to be nil. As for the BAT standards, since more friction materials plants must expend funds to comply with the guidelines (Table D-15), it is estimated that an industry-wide price rise on the order of 1.0 percent (for friction materials only) could occur as a result of these standards. Other asbestos products segments should witness no price increases.

Additional justification for the original contention that no serious constraints to increased cost pass-on exist may be obtained from the fact that the asbestos products in question are in fact specialty items, consumed in most cases by industries for whom the cost of asbestos products constitutes a very low percentage of the manufacturing cost of their end-products. In other markets, (e.g., the after-market sale of friction products), sales of asbestos products are relatively insensitive to price increases in the order of 1 percent.

Another factor which often tends to discourage price increases is the availability of imports and/or substitute products. Regarding imports, the U.S. traditionally has been a net exporter of asbestos products, as illustrated by the following statistics for 1973:

Product	Value of Imports	Value of Exports
Gaskets	Negligible	$ 1,442,446
Packing	Negligible	9,040,541
Heat or Sound Insulation	Negligible	2,850,444
Textiles & Yarns	$ 5,584,866	6,454,182
Clutch Facings & Linings	Negligible	1,870,055
Brake Linings	Negligible	7,862,805
TOTAL	About $6,000,000	$ 29,500,000

The aggregate statistics clearly suggest that import volumes are not sufficiently high as to deter justifiable cost pass-through to the domestic asbestos products consumers. Even in the textiles category where imports nearly equal exports, the supply/demand balance is such that domestic consumers are not expected to resist payment of price increases of the order of one percent. As for substitute products, no currently available substitutes enjoy the price-performance advantage of the asbestos products in each of the applications under consideration. For instance, graphitic packings and mechanical seals have only succeeded in capturing small highly-specialized segments of the packing/sealing devices markets.

TABLE D-16

IMPACT OF PROPOSED GUIDELINES ON RETURN ON INVESTMENT

Plant	Plant Investment for Asbestos Products[1] Range ($MM)	New Investment for BAT as % of Current Investment Range (%)	Average and Range of ROI for Total Corporation ROI (%)[2]	Range of Return on Plant Investment for Asbestos Products Baseline (%)	BPT (%)	BAT (%)
S-1	n.a.[3]	n.a.	n.a.	n.a.	n.a.	n.a.
FM-2	0.7 - 1.4	11 - 23	n.a.	n.a.	n.a.	n.a.
FM-3	0.9 - 1.4	7 - 11	9 ± 100%	8-12	8-12	7-10
FM-4	0.5 - 1.0	5 - 9	7 ± 40%	5-10	5-10	4-8
FM-6	18.0 -30.0	0.5 - 1	7 ± 50%	6-10	6-10	6-10

Basis: Recent industry supply-demand and pricing environment, present operating standards with respect to other than the guidelines under study.

Notes: [1]Plant investment and working capital associated with relevant asbestos products manufacturing.

[2]Average of the annual after-tax earnings divided by stockholders' equity at beginning of the year for the last five years. Variability expressed as a percentage around the average value. Figures rounded.

[3]"n.a." denotes data for meaningful estimates not available.

SOURCE: The information presented above represents contractor estimates derived in part from information presented in company reports, SEC filings, statistical services, industry studies, and other sources believed reliable. The accuracy and completeness of such sources and information are not guaranteed.

(3) Production, Employment, Community, and Other Effects: Since, as stated before, production curtailments and plant closures are not expected to occur as a direct consequence of the proposed effluent quality standards and since it is believed that additional costs incurred as a result of the BPT and BAT standards can be readily recouped by passing them on to product consumers in the form of higher prices, it is therefore concluded that there will be no direct impact (of these standards) on the production and market growth of the subject asbestos products. Accordingly, no adverse employment and community effects will result, and, other things being equal, the United States' favorable balance of trades position with respect to manufactured asbestos products should continue for the foreseeable future.

(4) Impacts of NSP Standards: As shown in Table D-8, new plants to which the NSP Standards are applicable will be designed, in most cases, on the principles of zero effluent discharge, achievable by either total waste containment, recovery, or use of dry dust collection systems. Only in the instance of solvent recovery operations are any treatable effluents expected, and for such operations, the effluent standards applicable are similar to those proposed as achievable by 1977 (BPT).

The above considerations, supplemented by the judgement that a no-discharge design philosophy (for new plants) will not significantly add to the initial and/or operating costs of a new plant, lead to the conclusion that there will be zero impact of the NSP Standards on new plant construction (and therefore, industry growth), product prices, plant location perferences (domestic versus overseas), and the national balance of payments posture. In other words, the costs associated with the minor manufacturing flowscheme redesign or waste handling and treatment alternatives called for in these standards will not act as a deterrent to the construction of new plant capacities for the subject asbestos products; neither will the standards, of themselves, be a significant constraint that could force a prospective plant to be preferentially located outside the United States.

(5) General: It should be stressed that, in arriving at the above conclusions with respect to the potential impacts of the proposed effluent guidelines, only the direct effects of these guidelines have been taken into consideration. It should be recognized that the subject segments of the asbestos products industry are concurrently being impacted by other factors including economics (e.g. escalating energy, materials, and labor costs), other governmental regulations (air pollution, health and safety), and social and public relations factors. Thus, whereas the incremental costs of meeting the effluent limitations guidelines may be of minor significance by themselves, the combination of all the above factors may, in fact, produce the adverse impacts that are not anticipated if only the effluent guidelines were in effect.

PART IV: LIMITS OF ANALYSIS

IV. LIMITS OF ANALYSIS

The above estimates of the potential economic impact of the proposed BPT, BAT, and NSP effluent standards for the asbestos textiles, friction materials, and gaskets/packings/sealing devices segments of the asbestos products manufacturing industry are predicated on basic technology and cost estimates contained in the Development Document for Effluent Limitations Guidelines for these segments. Accordingly, the analysis contained herein is accurate only to the extent that the document truly reflects the efficacy of the proposed technologies, as well as their associated costs. No effort has been made by this contractor to independently verify the data.

Additionally, the list of effluent-discharging plants in these subcategories (which is the basis for aggregate cost estimates) is taken from the said document and has not been independently verified.

It should be indicated that while the methodology of impact assessment adopted in this study is judged to be meaningful for identifying impact-sensitive facilities, the final decision to curtail or discontinue operations at a given plant is governed by a number of interacting factors. No actual financial data for specific plants were made available for this study, and hence the analysis of financial impact is based on necessarily imprecise estimates. While additional water treatment costs may, on the surface, appear as manageable additional burdens in light of a given plant's apparent sales volume and profit margin, the decision to continue, curtail, or terminate operations is generally made in light of corporate goals and expectations, present and future market conditions, etc.

Finally, as alluded to in prior discussion, the judgment in this study regarding the probable impact of the proposed effluent limitation guidelines has not taken into account the often concurrent and reinforcing effects of other legislations and governmental controls (specifically, air pollution, occupational health and safety, etc.) which, with the additional water treatment costs, may create a "last straw" effect, even though the water treatment costs may, by themselves, be negligible.

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ASBESTOS TEXTILES MANUFACTURING: SUMMARY OF ECONOMIC IMPACT

Industry - Asbestos Products Manufacturing
SIC Code - 3292

Plants in segment - 15 plants
% Total plants in industry - 20 percent

Plants direct discharging - None
% Total plants in segment - 0

Plants with BPT treatment in place - 15 plants
% Total plants in segment - 100 percent

	BPT	BAT
COST OF POLLUTION ABATEMENT		
Capital costs for segment		
Total capital cost	0	0
Total capital expenditures as % of average annual investment	0	0
Total capital expenditures as % of total capital in place	0	0
Annualized costs for segment		
Total incremental increase including capital charges	0	0
Total incremental increase excluding capital charges	0	0
Total incremental increase including capital charges as % of sales	0	0
EXPECTED PRICE INCREASE		
Expected increase due to pollution control	None	None
PLANT CLOSURES		
Total closures anticipated	None	None
% reduction of segment capacity due to closures	0	0
EMPLOYMENT		
Total # of employees affected	0	0
% of total employees in segment	0	0
COMMUNITY EFFECTS	None	None
IMPACT ON INDUSTRY GROWTH	None	None
BALANCE OF TRADE EFFECTS	None	None

FRICTION MATERIALS MANUFACTURING: SUMMARY OF ECONOMIC IMPACT

Industry - Asbestos Products Manufacturing
SIC Code - 3292

Plants in segment - 38 plants
% Total plants in industry - 51 percent

Plants direct discharging - 4 plants
% Total plants in segment - 11 percent

Plants with BPT treatment in place - 38 plants
% Total plants in segment - 100 percent

	BPT	BAT
COST OF POLLUTION ABATEMENT		
Capital costs for segment		
Total capital cost	0	$471,900
Total capital expenditures as % of average annual investment	0	7.4 percent*
Total capital expenditures as % of total capital in place	0	<1 percent
Annualized costs for segment		
Total incremental increase including capital charges	0	$91,000
Total incremental increase excluding capital charges	0	$83,720
Total incremental increase including capital charges as % of sales	0	0.04 percent
EXPECTED PRICE INCREASE		
Expected increase due to pollution control	0	About 1 percent
PLANT CLOSURES		
Total closures anticipated	None	None
% reduction of segment capacity due to closures	0	0
EMPLOYMENT		
Total # of employees affected	None	None
% of total employees in segment	0	0
COMMUNITY EFFECTS	None	None
IMPACT ON INDUSTRY GROWTH	None	None
BALANCE OF TRADE EFFECTS	None	None

*Based in part on the average New capital expenditure-to-value of shipments ratio for SIC 3292 in the 1958-67 period (U.S. Bureau of the Census).

GASKETS/PACKING/SEALING DEVICES MANUFACTURING: SUMMARY OF ECONOMIC IMPACT

Industry - Asbestos Products Manufacturing
SIC Code - 3293

Plants in segment - 22 plants
% Total plants in industry - 29 percent

Plants direct discharging - 1 plant
% Total plants in segment - 4.5 percent

Plants with BPT treatment in place - 21 plants
% Total plants in segment - 95.5 percent

	BPT	BAT
COST OF POLLUTION ABATEMENT		
Capital costs for segment		
Total capital cost	$73,000	0
Total capital expenditures as % of average annual investment	0.05 %	0
Total capital expenditures as % of total capital in place	0.3 %	0
Annualized costs for segment		
Total incremental increase including capital charges	$35,500	0
Total incremental increase excluding capital charges	$32,700	0
Total incremental increase including capital charges as % of sales	0.02 %	0
EXPECTED PRICE INCREASE		
Expected increase due to pollution control	None	None
PLANT CLOSURES		
Total closures anticipated	None	None
% reduction of segment capacity due to closures	0	0
EMPLOYMENT		
Total # of employees affected	None	None
% of total employees in segment	0	0
COMMUNITY EFFECTS	None	None
IMPACT ON INDUSTRY GROWTH	None	None
BALANCE OF TRADE EFFECTS	None	None